

NAME: \_\_\_\_\_

DATE: \_\_\_\_\_

PER. \_\_\_\_\_

### METRIC MEASUREMENT LAB

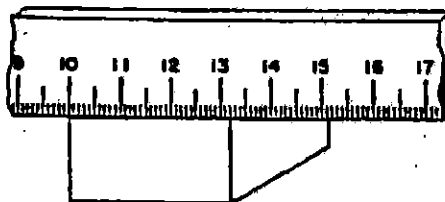
**PROBLEM:** How do we measure length, volume, temperature & mass in the metric system?

**MATERIALS:** Meter Stick  
Metric Ruler  
Triple Beam Balance  
Block  
Fishing Weight  
2 - 100 ml Graduated Cylinder  
2 - 150 ml Beaker  
Ice  
Thermometer

**PROCEDURE: (PUT ALL YOUR ANSWERS IN THE "RESULTS SECTION")**

#### PART A – MEASURING LENGTH – PLACE ALL ANSWERS IN DATA TABLE #1

1. Look at your meter stick. How many numbers are on the meter stick?
2. How many lines are between two numbers that are right next to each other?
  - a. What is this measurement called, i.e, cm, meter, dm.
3. How many lines on the meter stick make up a centimeter?
4. What are each of the little lines on the meter stick called?
5. Look at the block in the figure below and answer the questions.
  - a. What is the measurement of the block in centimeters?
  - b. What is the measurement of the block in millimeters?



6. Choose 3 objects in the room and measure them – be sure to convert to the proper units indicated in Table #1.

## **PART B – MEASURING MASS – PLACE ANSWERS IN DATA TABLE #2**

1. Look at your triple beam balance and answer the following questions.
  - a. How much mass does the first, second and third divisions on the beam represent?
2. Turn on your electronic balance by pressing the “on/off zero” button once.
  - a. The display should read “0.0 g” If the balance does not read 0.0, do the following:
    - (1). press the “on/off zero” button once more and the display should read zero.
  - b. check to make sure that there is a lower case “g” in the lower right hand corner of the display. If not, do the following:
    - (1): press the “Unit Cal” button (located left of the display window) until the lower case “g” appears.
3. Choose 3 objects and using the electronic balance determine the mass of each object and record this in Data Table #2 – DON'T FORGET TO INCLUDE THE UNITS!!!

## **PART C: MEASURING THE VOLUME OF A SOLID – PLACE ANSWERS IN DATA TABLE #3**

1. Using the large block located at this station, measure the length, width and height of this block and record your measurements in Data Table #3 (DON'T FORGET THE UNITS).
  - a. This is how you measure the volume of a “regularly” shaped object like a cube.
  - b. Calculate the actual volume of the cube by the following formula:  $L \times W \times H$  and place this answer in Data Table #3. What units should you use for volume????
2. **Measuring the volume of an irregularly shaped object** – Since you cannot measure the length, width or height of an irregularly shaped object such as a fishing weight, you must use a different method to do this.
  - a. What is this method called?
  - b. How would you calculate the volume using this method?
3. Take the graduated cylinder and fill it with 50 ml of water. Record this in Data Table #4
4. Carefully drop the fishing weight into the water and record the water level in Data Table #4.
5. Using the method in #2 above, record the volume of the marble in Data Table #4 (DON'T FORGET THE UNITS).

## **PART D: MEASURING THE VOLUME AND TEMPERATURE OF A LIQUID – PLACE ALL ANSWERS IN DATA TABLE #5**

1. Using the 2 150 ml Beakers, mark on beaker as “A” and one beaker as “B” using the marker provided at this station.
2. Using the graduated cylinder at the station, measure 50 ml of water into the graduated cylinder.

3. Pour this into Beaker A. Record this volume in Data Table #5 (Initial Volume)
4. Repeat steps 2 and 3 for Beaker B.
5. Using the thermometer, measure the temperatures of both Beakers A & B and record this information in Data Table #5. (DON'T FORGET UNITS).
6. Add 2 ice cubes to Beaker "B" - **ONLY**.
7. Using one minute intervals, record the temperature of the Beakers for 3 minutes and record this in Data Table #5.
8. Again using the graduated cylinder, pour the water from Beaker A into the cylinder and record the volume in Data Table #5.
9. Repeat step 8 for Beaker "B".

## **RESULTS**

### **PART A – LENGTH.**

1. \_\_\_\_\_
2. \_\_\_\_\_
  - a. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_  
\_\_\_\_\_

DATA TABLE #1 – Give this Data Table a title.

OBJECT	Length (m)	Length (cm)	Length (mm)

### **PART B – MEASURING MASS**

1. a. 1<sup>st</sup> division - \_\_\_\_\_  
2<sup>nd</sup> division - \_\_\_\_\_  
3<sup>rd</sup> division - \_\_\_\_\_

Data Table #2 – Give the Table a title.

OBJECT	MASS (g)

### PART C – MEASURING VOLUME

1. b. – What are the units used for the volume of a solid? \_\_\_\_\_
2. a. – What method is used to calculate the volume of an **irregularly shaped** object?

\_\_\_\_\_

b. Explain how you would calculate the volume of an irregularly shaped object using the method from 2(a) above. \_\_\_\_\_

\_\_\_\_\_

**Data Table 3 – MEASURING VOLUME - Give the Table a title**

<b>BLOCK</b>	<b>Length (cm)</b>	<b>Width (cm)</b>	<b>Height (cm)</b>	<b>Volume(cc or cm<sup>3</sup>)</b>

**Data Table #4 – Give the Table a Title**

<b>FISHING WEIGHT</b>	<b>Starting volume of H<sub>2</sub>O</b>	<b>Volume of marble + H<sub>2</sub>O</b>	<b>Volume of Marble</b>

**PART D – MEASURING TEMPERATURE & VOLUME OF WATER**

**Data Table # 5 – Give the table a title**

<b>Beaker</b>	<b>Starting Vol. (ml)</b>	<b>Starting Temp. (°C)</b>	<b>1 minute Temp. (°C)</b>	<b>2 minute Temp. (°C)</b>	<b>3 minute Temp. (°C)</b>	<b>Final Vol. (ml)</b>
<b>A</b>						
<b>B</b>						

## CONCLUSION

1. Why is the metric system easier to use than the English Standard System? \_\_\_\_\_

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2. In general, how do you convert meters into the following units?

a. centimeters \_\_\_\_\_

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b. millimeters \_\_\_\_\_

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c. kilometers \_\_\_\_\_

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3. How would you convert the following measurements:

a. grams to kilograms \_\_\_\_\_

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b. kilograms to grams \_\_\_\_\_

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4. Why should you not place a powdery substance directly on to the triple beam balance? \_\_\_\_\_

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5. Which technique that you used in this lab is more accurate to measure the volume of a solid? Why? \_\_\_\_\_

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6. What is the meniscus? \_\_\_\_\_

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7. Why did the temperature of Beaker "B" change? \_\_\_\_\_

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8. How did the final volumes of Beakers "A" and "B" compare? Why were they different?

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